

Unit 13

Day 4

Inverse of a Function

# QUICK QUIZ:

Name \_\_\_\_\_

Date \_\_\_\_\_

$$f(x) = \frac{1}{x-6} \quad g(x) = \frac{8}{3x}$$

Find:

$$1) f + g = \left( \frac{1}{x-6} \right) \frac{3x}{3x} + \left( \frac{8}{3x} \right) \frac{(x-6)}{(x-6)} = \frac{3x}{3x^2 - 18x} + \frac{8x - 48}{3x^2 - 18x} = \frac{11x - 48}{3x^2 - 18x}$$

$$2) \frac{f}{g} = \frac{\frac{1}{x-6}}{\frac{8}{3x}} = \frac{1}{x-6} \cdot \frac{3x}{8} = \frac{3x}{8(x-6)}$$

$$3) f \circ g = \frac{1}{\frac{8}{3x} - 6} = \frac{1}{\frac{8 - 18x}{3x}} = \frac{3x}{8 - 18x}$$

To find the inverse, switch the roles of  $x$  &  $y$

Ex1:  $P = \{(2,4)(1,1)(-3,9)(0,0)(-5,25)\}$

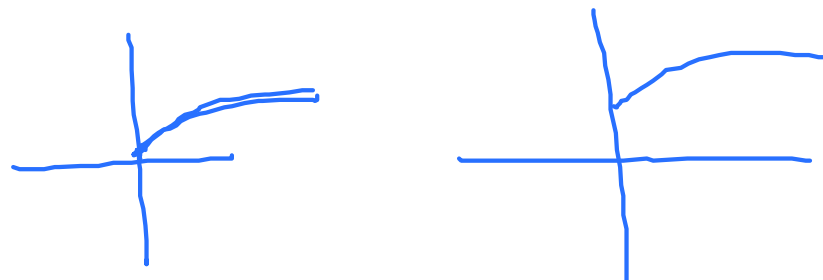
Inverse:  $P^{-1} = \{(4,2), (1,1), (9,-3), (0,0), (25,-5)\}$

Domain of Inverse:  $D = \{4, 1, 9, 0, 25\}$

Range of Inverse:  $R = \{2, 1, -3, 0, -5\}$

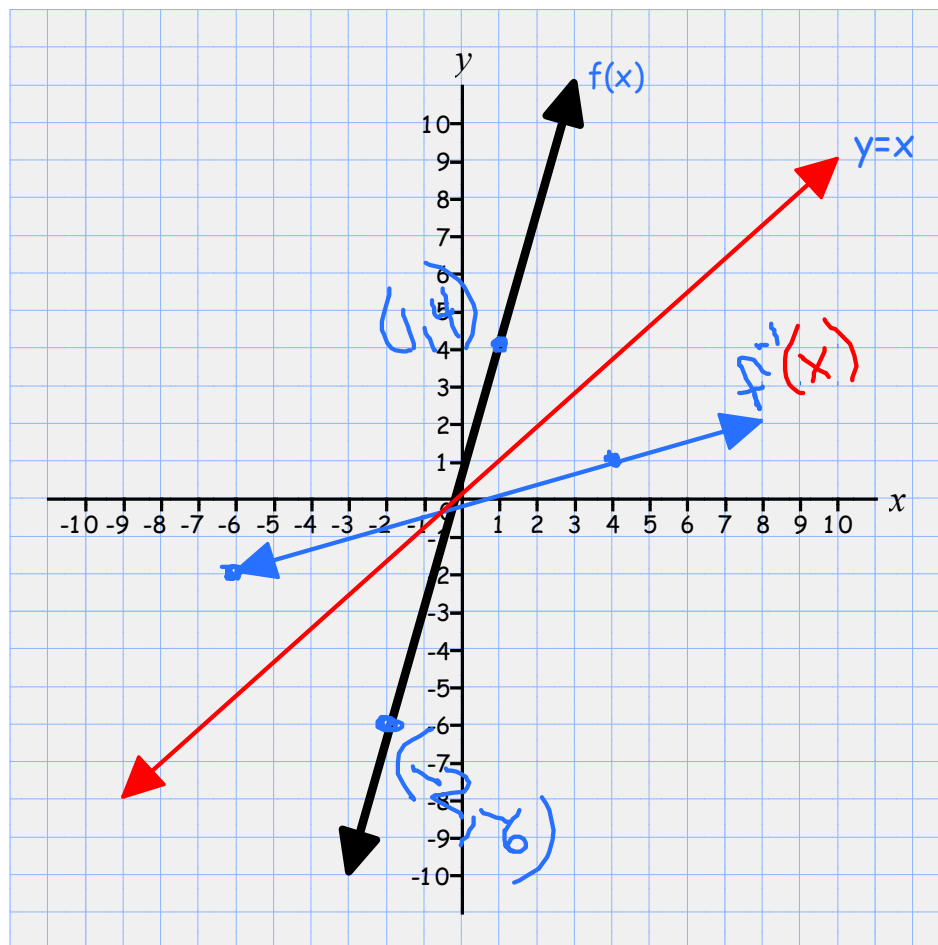
The inverse of  $f(x)$  is denoted by  $f^{-1}(x)$ . State the domain and range of each. The domain of  $f(x)$  is the range of  $f^{-1}(x)$  and vice versa.

Find  $f^{-1}(x)$ .



$f(x) = 3x + 2$ $D: (-\infty, \infty), R: (-\infty, \infty)$ $x = 3y + 2$ $x - 2 = 3y$ $f^{-1}(x) = \frac{x-2}{3}$ $D: (-\infty, \infty), R: (-\infty, \infty)$	$f(x) = x^3 - 5$ $D: (-\infty, \infty), R: (-\infty, \infty)$ $x = y^3 - 5$ $x + 5 = y^3$ $f^{-1}(x) = \sqrt[3]{x+5}$ $D: (-\infty, \infty), R: (-\infty, \infty)$	$f(x) = \sqrt{x+3}, x \geq -3$ $D: [-3, \infty), R: [0, \infty)$ $x = \sqrt{y+3}$ $x^2 = y+3$ $y = x^2 - 3$ $D: [0, \infty), R: [-3, \infty)$
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Graph the inverse of  $f(x)$



$f^{-1}$  is a function if and only if (iff)  $f$  is one-to-one

How to determine if a function is one-to-one.

- \* If the function is a set of points, the points may **not** have repeated **x or y values**.
- \* If the function is an equation, solve for  $x$  and if  $\pm$  results then the function is not one-to-one.
- \* If the function is graphed, use horizontal line test.

Are the functions one-to-one?

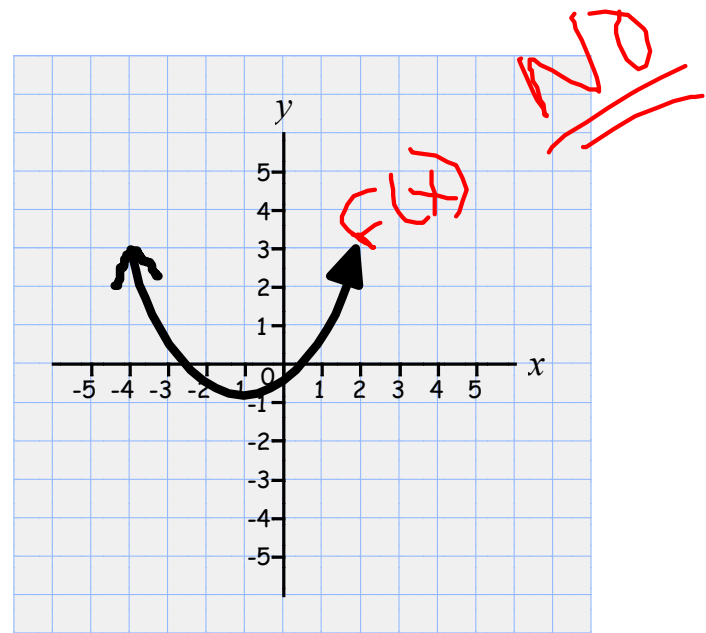
Ex2:  $m = \{(3,7)(-2,4)(1,-3)(-6,8)(0,5)(9,-2)\}$

Yes - 1 to 1

Ex3:  $y = \sqrt{5 - x^2}$

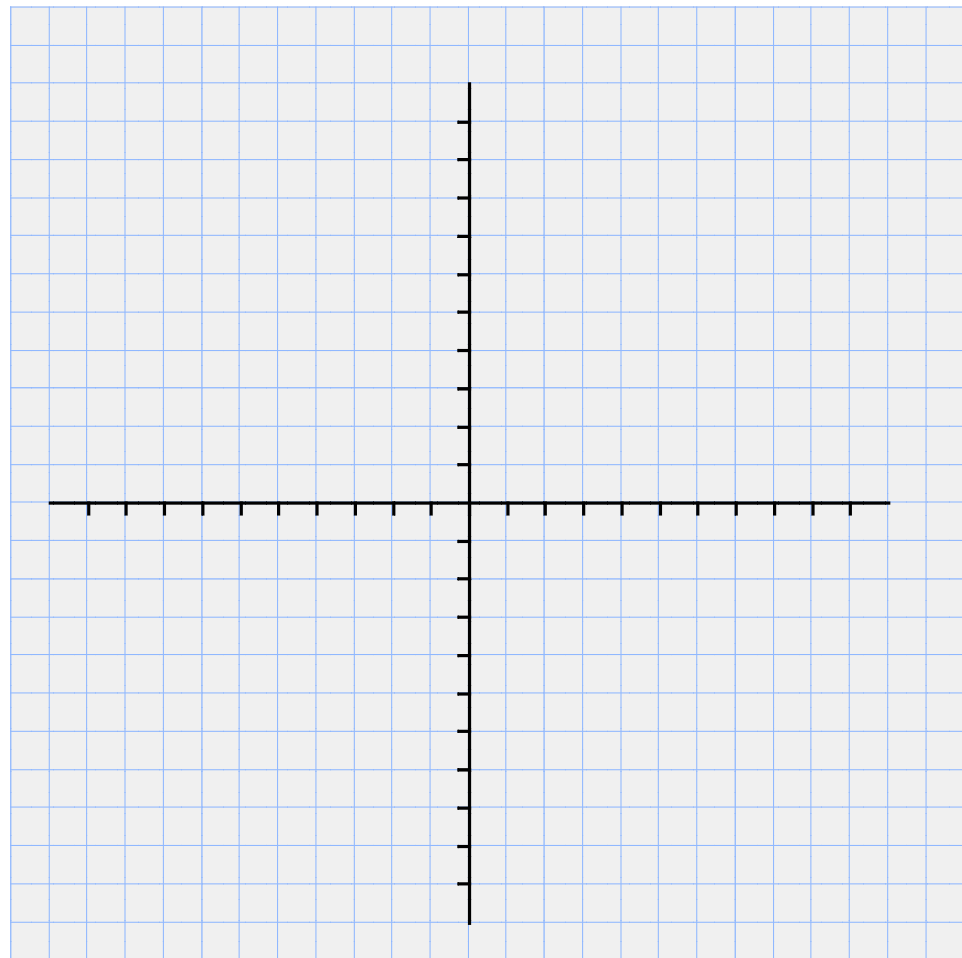
Ex4:

$$\begin{aligned}x &= \sqrt{5 - y^2} \\x^2 &= 5 - y^2 \quad \text{NO} \\x^2 - 5 &= -y^2 \\y^2 &= -x^2 + 5 \\y &= \pm \sqrt{-x^2 + 5}\end{aligned}$$



For the function, determine if it is one-to-one. If so, write an equation for the inverse. State the domain and range of the function and its inverse. Graph both.

$$y = 3x + 2$$





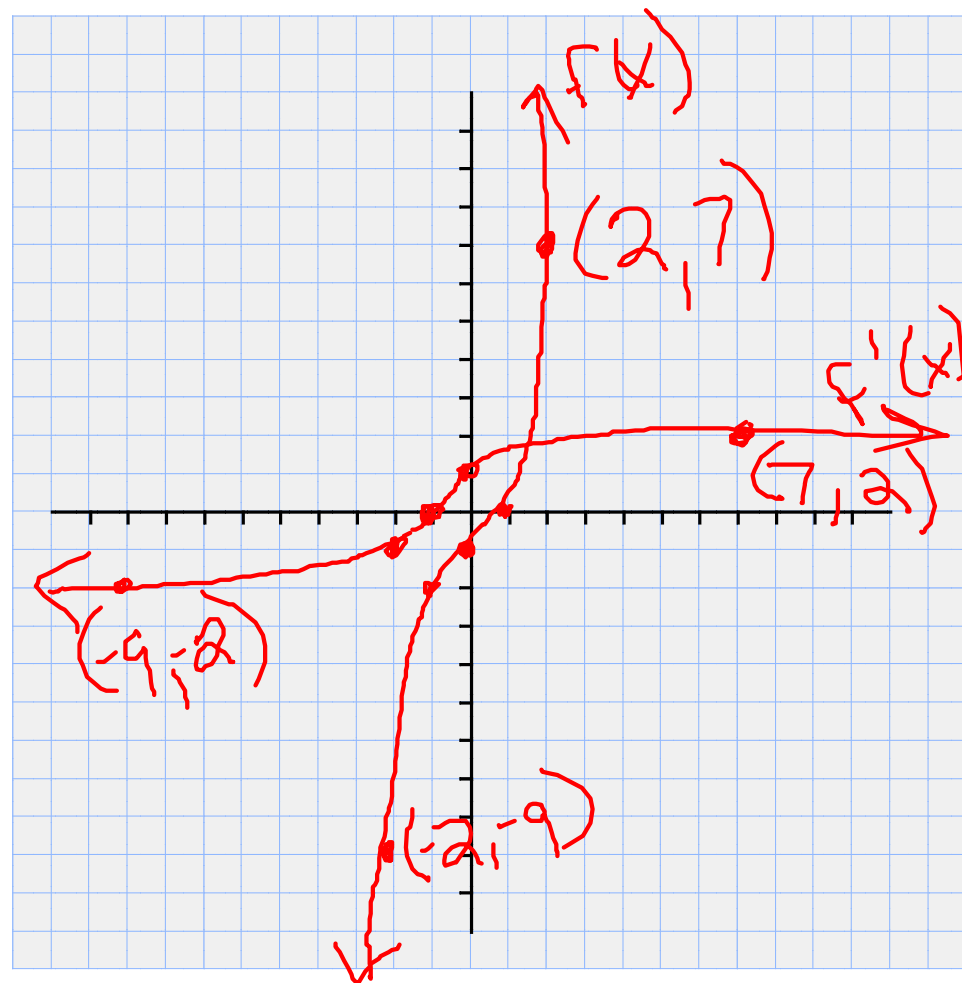
For the function, determine if it is one-to-one. If so, write an equation for the inverse. State the domain and range of the function and its inverse. Graph both.

$$y = x^3 - 1$$

$$X = y^3 - 1$$

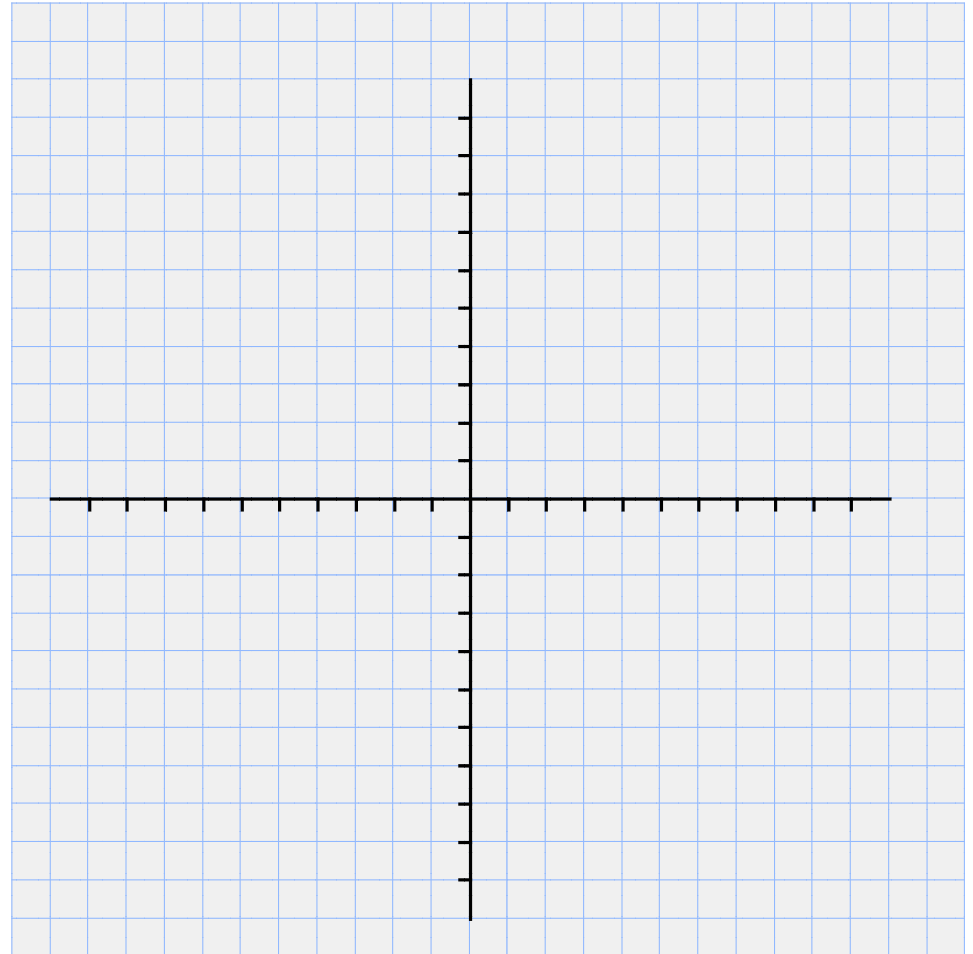
$$X + 1 = y^3$$

$$y = \sqrt[3]{X+1}$$



For the function, determine if it is one-to-one. If so, write an equation for the inverse. State the domain and range of the function and its inverse. Graph both.

$$y = \sqrt{x^2 - 9}$$



HOMEWORK:

UNIT 13 DAY 4

p 355-7: 13-26, 61-70